

**Breathable Housing:
Incorporation of Agricultural By-Products in
Housing Systems for Tropical Climates**

by

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ABSTRACT

Alternative housing solutions are needed in developing countries to address the world-wide growth of slums and the sharp rise in energy consumption. Tropical housing designed according to bio-climactic principles and constructed of emerging bio-materials can offer an alternative to hot and humid conditions in prototypical social housing schemes. This thesis investigates the viability of experimental systems using coconut husk as a raw material that can yield diverse building products. Coconut husk's high lignin content – an intrinsic biopolymer – eliminates the need for synthetic polymeric binders required in other lignocellulosic construction products. When manufactured as a desiccant board, the coconut husk absorbs water vapor, creating a drier, more comfortable environment. Coconut husk board promises to be a viable and high-performing substitute for imported wood-based sheathing and siding products, especially in the tropics, where a substantial volume of husk by-product from coconut production waste chain can be reclaimed and processed into building materials at an industrial scale. The proposed system design integrates structural use of coconut husk boards with passive cooling strategies to provide greater comfort (in terms of humidity and temperature) with the potential to reduce energy consumption in a broad range of housing types.